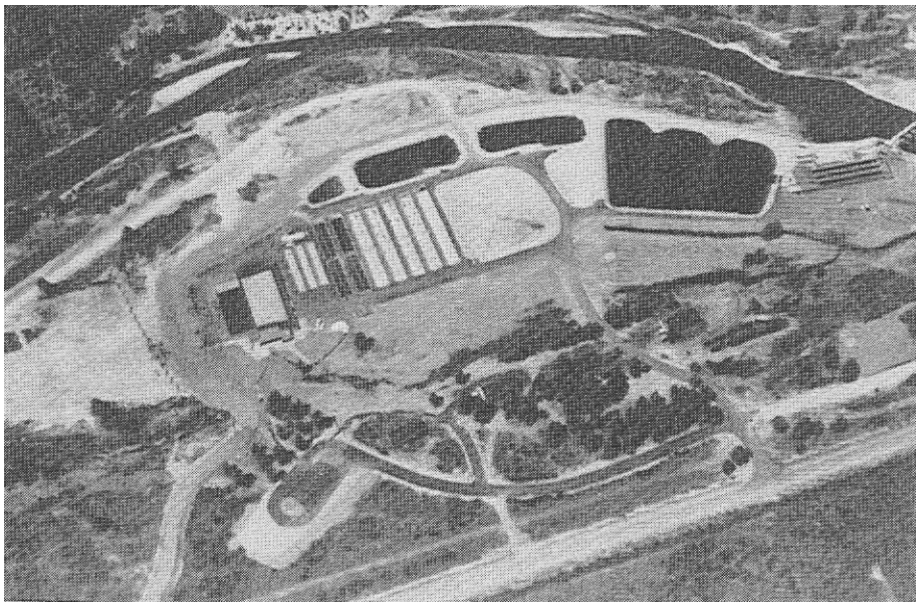
SAWTOOTH FISH HATCHERY
and
EAST FORK SATELLITE

1994 Spring Chinook Brood Year Report
1995 Steelhead Brood Year Report



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1994 SPRING CHINOOK SALMON

ABSTRACT

The Sawtooth trap and weir were put into operation on May 31, 1994 and operated through October 26, 1994. A total of 96 spring chinook salmon *Oncorhynchus tshwytscha* (50 males, 40 females and 6 jacks) were trapped. Released above the weir were 83 fish (44 males, 33 females and 6 jacks) to spawn naturally. Prespawning mortality of ponded fish totaled one male for a 1.3 percent prespawning mortality rate.

Spawning began on August 8 and continued through September 10, with seven spawning days. We spawned 7 females, 17 males and one jack for 29,933 green eggs (4,276 eggs per female), which yielded 26,232 eyed eggs for an eye-up rate of 87.6% (11 males and one jack were released after being spawned). From these eyed eggs, 25,632 fry were ponded, which resulted in a smolt release of 25,006 smolts.

The East Fork Satellite fish trap and velocity barrier were put into operation on June 6, 1994 and continued operating through September 8, 1994. A total of 15 spring chinook salmon (11 males, 4 females, 0 jacks) were trapped with all 15 fish being released to spawn naturally. No pre-release mortality occurred.

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INTRODUCTION

Funding Source

Sawtooth Fish Hatchery is part of the Lower Snake River Compensation Plan and has been in operation since 1985. The hatchery and satellite facility were built by the U.S. Army Corp. of Engineers and is funded through the U.S. Fish & Wildlife Service.

Location

Sawtooth Fish Hatchery is located five miles south of Stanley, ID. The facility's 71 acres borders the Salmon River to the west, Highway 75 to the east and US Forest Service ground to the south and north. The Sawtooth weir is approximately 400 miles from Lower Granite Dam and 950 miles from the mouth of the Columbia River. Chinook salmon *Oncorhynchus tshawytscha* are released directly into the river at the hatchery and above the hatchery in the headwaters of the Salmon River. Sawtooth steelhead are released at the hatchery, along the lower Salmon River, and various other drainages around the state.

Sawtooth Fish Hatchery has operated a satellite facility on the East Fork of the Salmon River since 1984. The facility is situated eighteen miles upstream on the East Fork Salmon River. The mouth of the East Fork Salmon River is located 42 miles downriver from Sawtooth Fish Hatchery. The property was purchased from the Bureau of Land Management (BLM) and is surrounded by private land. An access road easement was purchased from a private landowner who owned property surrounding the location. The east side of the property borders the East Fork of the Salmon River. Historically, all East Fork fish have been returned to the East Fork River.

Species Reared

Sawtooth Fish Hatchery is involved in trapping, spawning and rearing spring chinook salmon to the smolt stage for release. A-run steelhead trout *Oncorhynchus mykiss* are also trapped and spawned. The steelhead eggs are incubated to eye-up then transferred to other hatcheries for rearing.

The East Fork facility handles spring chinook salmon as well as B-run steelhead trout. The green eggs from fish spawned at the East Fork station are transferred to Sawtooth Fish Hatchery for incubation. The spring chinook salmon are reared at Sawtooth Fish Hatchery with the steelhead being transferred as eyed eggs to other hatcheries for rearing.

Broodstock History

Historically, all of the Sawtooth Fish Hatchery and the East Fork trap broodstock have come from the upper Salmon River and the East Fork River respectively. There was introduction of Rapid River stock at the Sawtooth site and in the headwaters of the Salmon River in the late 1970s and early 1980s as fry and smolt plants. East Fork B-run fish have been supplemented with Dworshak B-run stock since the mid 1980s.

At both facilities returning adult fish are released to spawn naturally. Numbers of fish released depend on how many marked and un-marked fish return. Fish handling is dictated by The National Marine Fisheries Service under Permits #919 and #920. Typically at Sawtooth, about one third of the salmon are released. All un-marked steelhead are released along with enough marked hatchery fish to ensure paring of adults. At the East Fork, all salmon are released until a total of twenty pairs have been passed above the weir. All un-marked steelhead are released along with enough marked hatchery fish to ensure equal adult pairings. A historical synopsis of releases and returns is shown in Appendix A.

OBJECTIVES

Mitigation Goals

As part of the Lower Snake River Compensation Plan, Sawtooth Fish Hatchery's mitigation goals are expressed in adult returns: 19,000 adult salmon over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

Idaho Department of Fish and Game objectives are:

1. To produce 2.4 million smolts for release, of which, up to one million of the East Fork-orgin smolts will be returned to the East Fork of the Salmon river.

2. Produce quality fish for supplementation programs.

3. Implement research programs at the hatchery to improve returns to the hatchery.

FACILITY DESCRIPTION

Hatchery Description

The hatchery's main building is 134 ft by 166 ft and consists of an office, meeting room, lab, visitor/interpretive center, wood shop, welding/fabrication shop, intake collection box/chemical room, shop office, incubation and early rearing room, one inside storage room, two outside covered storage areas, generator room, furnace room, and a feed freezer/chemical equipment room. The hatchery has four pump houses (each is 14 ft x 11 ft), one is for domestic water and three are production wells. An intake building (15 ft x 37 ft) is located one-half mile upstream from the hatchery and Salmon River water is collected for outside production rearing. The temporary employee dorm and adult spawning facility are located 300 yards downstream of the hatchery building. The dorm (38 ft x 72 ft) has three bedrooms with a bath in each, attached public rest-room facilities, storage and laundry room, living and dining room with an open kitchen. The adult facility consists of three adult ponds and an enclosed spawning shed (35 ft x 52 ft). There are five resident

houses at Sawtooth, all about 1,360 square ft with attached single car garages and separate wood sheds.

The East Fork has a roof structure over a 28 ft travel trailer that is used as a residence while the trap is in operation. The other building is a combination shop, storage, and spawning shed (22 ft x 44 ft).

Production Capabilities

Production capacities at the East Fork trap consists of two 68 ft x 10 ft x 4.5 ft adult holding ponds (3,060 cubic ft) and a 10 ft x 17 ft fish trap. No fish are reared at this facility. All green eggs are shipped to Sawtooth Fish Hatchery.

Production capacities for Sawtooth include 100 stacks of Flex-a-lite Consolidated Incorporated (FAL) incubators containing 800 trays with the potential to incubate five million chinook eggs or seven million steelhead eggs. Inside rearing consists of sixteen semi-square tanks with an individual volume of 17 cubic feet and a capacity of 15,000 swim up fry each, 14 inside rearing tanks with an individual volume of 50 cubic feet and a capacity for 30,000 fry each, and 12 inside rearing vats with an individual volume of 391 cubic feet and a capacity for 100,000 fry each. Outside rearing consists of 12 fry raceways each with 750 cubic feet of rearing space and 28 production raceways each with 2,700 cubic feet of rearing space. Each production raceway has a capacity to raise 100,000 chinook to smolt stage for a total capacity of 2.8 million fish. These production raceways are serial reuse that flow from an upper raceway to a lower one.

The adult facility has three concrete adult fish holding ponds with 4,500 cubic feet of holding area. Each pond can hold approximately 1,300 adults.

RECOMMENDATIONS

Recommendations for Sawtooth Fish Hatchery include: developing additional wells for disease-free rearing water, modifying the river water intake to reduce winter icing problems, improving/repairing gabiens at the weir and intake, covering raceway tail-race openings with grating for added safety, modify the river water back-up valve for the hatchery building water supply to allow water in automatically if the wells fail, and seal coating the roadways.

East Fork recommendations include developing separate holding ponds for smolt acclimation, modifying the intake screen to exclude fish fry, and modifying the velocity barrier to prevent injury to migrating fish, and develop a removal system for debris that accumulates on the weir.

WATER SUPPLY

Source

Sawtooth Fish Hatchery receives fish culture water from the Salmon River and two production wells. Rearing water from the river enters an intake structure located one-half mile

upstream from the hatchery building, and flows through a 54 inch pipe to a control box located in the hatchery building for final screening. This water is then distributed to the indoor vats, outside raceways or adult fish facility. Incubation and early-rearing water is provided by two production wells. Excess well water is spilled into the control box for use in the outside raceways. A third well provides tempering water introduced at the river intake to reduce winter icing problems.

The East Fork trapping site receives water from the East Fork of the Salmon River via gravity-flow piping throughout the holding ponds. A well provides domestic water and pathogen free water for spawning and egg hardening. No fish are reared at the East Fork trap.

Quantity and Temperature

The wells provide 3.1 cfs of pumped water and temperatures range from 39° F (4° C) in the winter to 52° F (11° C) in the summer. The river provides up to 55 cfs of gravity-flow water and ranges in temperature from 32° F (0° C) in the winter to 68° F (20° C) in the summer (Figure 1).

Water Quality

The last water quality analysis from the collection box at the river was completed in June, 1993. Results include: hardness at 68 mg/L; total alkalinity as $CaCO_3$ at 74; bicarbonate alkalinity as $CaCO_3$ at 74; sp.conductance at 157 (umhos/cm); total ammonia as N at 0.043 (mg/L); total NO_2 + NO_3 as N at 0.073; total Kjeldahl N as N at <0.05 (mg/L); total phosphorus as P at <0.05 (mg/L); ortho phosphate as P at 0.019; and pH at 8.0. The most noticeable variances from the 1985 tests were: ortho-phosphate, which was <.003 mg/l in 1985 to .019 mg/l in 1993 and iron, which was 120 ug/l in 1985 to 20 ug/l in 1993. Additional information is shown in Appendix B.

FISH HEALTH

Diseases Encountered and Treatment

No major disease outbreaks were encountered with any of the BY94 spring chinook salmon raised at Sawtooth Fish Hatchery. All fish were given two separate prophylactic 21 day erythromycin feed treatments to control BKD.

Important pathogens found at Sawtooth Fish Hatchery are *Renibacterium salmoninarum* (BKD), *Myxobolus cerebralis* (whirling disease), *Diplostomum* spp. (eye fluke), and *Cytophaga psychrophilia* (Cold Water Disease). Both *Myxobolus* and *Diplostomum* have been controlled with concrete raceways. Although *Cytophaga is* ubiquitous in the environment, Cold Water Disease is not expressed at this hatchery unless stressful conditions predispose the fish to disease (Appendix C).

Both facilities have been relatively disease-free, although Sawtooth and East Fork chinook have had an incidence of BKD in the past. A BKD segregation program was implemented at this hatchery in 1989, with apparent success in limiting mortalities to high BKD raceways (91-153 & 91-154). In times of warm-water temperatures or handling, some fish will show the typical signs of this disease. The focus of the fish health program at Sawtooth is control of BKD. This segregation starts

at the eye-up stage and continues until release (smolt stage). The fry are kept on well water for as long as possible before removing them outside on river water, which reduces whirling disease.

Several programs have been implemented at Sawtooth Fish Hatchery to help raise a better quality smolt. Outside raceway baffles were tested in two raceways and shade-cover was installed on all the outside raceways.

STAFFING

Five permanent personnel are stationed at Sawtooth Fish Hatchery: a Hatchery Manager II; an Assistant Hatchery Manager; a Utility Craftsman; and two Fish Culturists.

The temporary employee staffing includes; 8 months of Fishery Technician time, 42 months of Biological Aide time, and 27 months of Laborer time.

FISH PRODUCTION

Spring Chinook Adult Collection

The Sawtooth Fish Hatchery chinook-trapping season began on May 31, 1994 and continued through September 9, 1994. The peak of the run occurred June 21, 1994 (Appendix U). A total of 96 spring chinook salmon were trapped including 50 males, 40 females, and 6 jacks (Appendix L, Appendix G). Released above the weir were 83 salmon which included 44 males, 6 jacks, and 33 females (11 males and one jack were used for spawning prior to release) Appendix M, Appendix I. Marked fish recoveries included: 13 CWT fish (10 male), 3 ad-clipped, 5 LV clipped, 2 possibly otter killed, and 2 female (one LV-clip and one ad-clip), and one unknown (otter kill).

The East Fork trap was in operation from June 6, 1994, to September 8, 1994. The East Fork's run peaked July 8, 1994 (Appendix V). A total of 15 spring chinook salmon were trapped. In all, 11 were males, 0 were jacks, and 4 were females (Appendix L). All fish trapped were released above the weir to spawn naturally Appendix M, Appendix H,I. No CWT marked fish were recovered.

Sawtooth Fish Hatchery had a male:female ratio of 58% males and 42% females. The East Fork's male:female ratio was 73% male and 27% female.

The CWT recoveries indicated one three-year old, 10 four-year old, and 2 five-year old fish returned to Sawtooth Fish Hatchery. No snouts were recovered from the East Fork Facility (Appendix W).

Adult Treatments

Sawtooth Fish Hatchery and East Fork adult chinook were injected with erythromycin phosphate at a rate of 20 mg active per kg. body weight. Injections were given intraperitoneal posterior to the pelvic fins. The Sawtooth ponded adults were treated three times per week in a one-hour 175 ppm formalin flush. No adults were ponded at the East Fork.

Prespawning Mortality

Sawtooth Fish Hatchery had one pre-spawning mortality of ponded fish for a 1.3% mortality rate. One male adult died prior to spawning at Sawtooth. East Fork had no pre-release mortality.

Spawning Operations

Spawning activities at Sawtooth Fish Hatchery began August 8 and concluded September 10, 1994. The seven egg takes during this period yielded 29,933 green eggs from seven females for an average fecundity of 4,276 eggs per female. There were 17 male and one jack salmon used for fertilization (Appendix J). Each female's eggs were separated in half and fertilized by two separate male salmon. The eggs were then recombined and water hardened for one hour in a buffered 100 ppm titrateable iodine solution. The eggs were then put into Heath incubator trays, with one female per tray for BKD segregation.

All adults trapped at the East Fork Facility were released. No spawning occurred.

Incubation

Each eight-tray Heath stack had flows set at 5 gpm of well water. Eggs were incubated one female per tray for BKD segregation. This averaged about 45 oz. or approximately 4,276 eggs per tray. All incubated eggs were treated with a 1,667 ppm formalin bath for 15 minutes starting three days after fertilization at five times per week for fungal control.

Well temperatures ranged from 50° F to 41° F during the incubation period. The eggs eyed-up at 480 thermal units (TU). At eye-up the eggs are shocked by dropping them from one container to another, picked and enumerated by hand count. The eggs are shocked at 530 TU and hatch at 1,300 TU.

Sawtooth green eggs eyed up at a 87.6% rate, yielding 26,232 eyed eggs (Appendix D).

Early Rearing

The swim-up fry were transferred from the Heath trays to semi-square tanks measuring 42 inches x 42 inches x 17 inches which were plumbed into existing vat well water supply. The swim-up fry were kept at a high density during feed training (1.2 lbs/cubic ft) until all the fish were on feed. After all the fish were eating well, they were transferred to inside vats. The vats contained PVC baffles every four feet. The vats are 4 ft wide x 3 ft deep x 40 ft long, with key- ways to allow lengths of either 10 ft, 20 ft or 40 ft, thus creating rearing volumes of 120, 240, or 480 cubic ft.

Starting flows for the swim-up fry were set at 3 gpm in each semi square tank, and then 20 gpm per vat. As the fish grew, the flows were increased to a maximum of 110 gpm. Early rearing well water varied in temperature from 44° F at swim-up to 40° F when the fish were moved to the final rearing raceways.

All fry were started on Bio-Products Bio-Diet Starter #2 and #3. Feed amounts and sizes varied according to manufacturer recommendations as the fish grew. All fish were fed a prophylactic treatment of erythromycin during March at a rate of 4.5 g active per 100 lbs of fish (Appendix N). The fish were transferred outside for final rearing on September 1, 1995.

Final Rearing

The chinook were placed into two separate small raceways that measure 6 ft wide x 2.5 ft deep x 45 feet long. Initial densities were 0.15 lbs/cu ft and flows were 75 gpm. The raceways were baffled every seven feet, covered with shade covers, and fitted with automatic belt feeders until weather conditions prevented their use. River water supplies the outside raceways, so daily temperatures fluctuate up to 19°F. Seasonal variances range from lows of 32°F. during winter to 69°F in summer.

All outside fish were fed a diet of Bio Products Grower feed. Prior to moving the fish outside, they were fed a second 21-day prophylactic treatment of erythromycin at a rate of 4.5 g active per 100 pounds of fish to prevent the onset of BKD.

The finish weight of all BY 94 spring chinook smolts reared at Sawtooth Fish Hatchery was 1,250 pounds. The fish were fed 2,378 pounds of feed for a conversion rate of 2.0.

Fish Marking

Fish marking occurred during mid-July, 1995. A total of 25,082 fish were marked with an adiposed (AD) clip. The fish marking crew returned in February 1996, to Passive Integrated Transponder (PIT) tag 1,260 fish. The PIT tags are to evaluate downriver migration (Appendix O, Appendix E).

Fish Distribution

Fish release for Sawtooth stock BY94 smolts occurred March 26, 1996. A total of 25,006 supplementation smolts were released approximately ten miles upriver of the Sawtooth Fish Hatchery at the Blaine/Custer County Line Bridge into the Salmon River. The fish were released in the evening with migrating fish being captured in the Sawtooth smolt trap within four hours prior to release (Appendix R). All fish were released into the Salmon River at the Blaine/Custer County Line Bridge.

1995 STEELHEAD TROUT

ABSTRACT

The Sawtooth trap and weir were put into operation on March 15, 1995, and closed May 10 1995. A total of 532 adult steelhead *Oncorhynchus Mykiss* (379 males and 153 females) were trapped at the Sawtooth weir. A total of 26 steelhead were released above the hatchery to spawn naturally. This included 17 males (2 natural) and 9 females (2 natural). Of these released fish, 12 hatchery males and seven hatchery females were released into a weired-off section of Beaver Creek for a natural-spawning study, conducted by Alan Byrne, Department Research Biologist. There was no prespawning mortality at Sawtooth Fish Hatchery.

Spawning began on April 6, 1995 and continued through May 10, 1995 with ten spawning days. A total of 143 females were spawned with 290 males, yielding 630,300 green eggs for an average fecundity of 4,407 eggs per female. These green eggs resulted in 543,100 eyed eggs for an eye-up percentage of 86.2%. The eggs were shipped to Hagerman National Fish Hatchery for rearing.

The East Fork velocity barrier and trap were put into operation April 4, 1995, and ran through May 1, 1995. A total of 38 adult steelhead were trapped. This included 21 males and 17 females. Fish released above the weir to spawn naturally included four males (0 natural) and two females (two natural). There was no prespawning mortality

Spawning operations began on April 10, 1995, and continued through April 17,1995 with three spawning days. Fourteen females were spawned with 17 males, yielding 53,370 green eggs, for an average fecundity of 3,812 eggs per female. These green eggs resulted in 40,170 eyed eggs for an 75.3% eye-up rate. These eggs were shipped to Magic Valley Fish Hatchery for rearing.

An additional 3,457,350 green eggs from Pahsimeroi Fish Hatchery were incubated at Sawtooth Fish Hatchery. These eggs eyed up at an 79.7% rate, yielding 2,755,000 eyed eggs. These eyed eggs were shipped to the following hatcheries: Magic Valley received 803,000 as eyed eggs, Niagara Springs received 1,359,000 as eyed eggs and 42,000 as swim-up fry, Hagerman National received 343,000 as eyed eggs, and the Shoshone-Bannock Tribes received 208,000 eyed eggs for their streamside incubator program.

The Sawtooth, Pahsimeroi, and East Fork stock eyed eggs were released as smolts during the spring of 1996. Sawtooth and Pahsimeroi stock smolts were released at the following locations: acclimated release - 728,053 (this includes: 66,022 acclimated and released at Torrey's Hole, 554,499 acclimated and released at the Sawtooth weir, 85,025 acclimated BY95 release study smolts, and 22,507 BY94 release study smolts). An additional 68,585 smolts were direct released for a total of 774,131 BY95 smolts released. B-run steelhead smolts numbering 127,110 were released at the East Fork Trap. An additional 324,944 Dworshak B smolts were released into the East Fork below the trap. A total of 236,297 Dworshak B-run smolts were released into Slate Creek, roughly 100 yards from its mouth into a man-made release pool.

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FISH PRODUCTION

Steelhead Adult Collection

The Sawtooth weir and trap was put into operation on March 15, 1995, and closed May 10, 1995. The East Fork trap was put into operation April 4, 1995, and ran through May 1, 1995. The peak of the Sawtooth steelhead *Oncorhynchus Mykiss* run occurred during the second week of April, while the peak of the East Fork run occurred during the first and second weeks of April (Appendix F).

Sawtooth Fish Hatchery trapped a total of 532 adult fish, which included 379 males and 153 females (Appendix Q). All fish were scanned for CWT, with 56 LV-clipped, (53 tagged) fish being recovered. A total of 26 steelhead (17 males (2 natural) and 9 females (2 natural)) were released. Of the released fish, 5 males (3 hatchery and 2 natural), and 2 natural females were released immediately above the weir. The other adult fish were released as part of supplementation studies conducted by Alan Byrne, Department Research Biologist. These hatchery fish (12 males and 7 females), were placed into a weired-off section of Beaver Creek (Appendix K).

The East Fork facility trapped 38 B-run adult fish, 21 were males and 17 were females (Appendix Q). A total of four males (0 natural) and two females (two natural) were released above the velocity barrier to spawn naturally (Appendix K.) All fish were scanned for CWT with four left ventral (LV) clipped, (three tagged) fish being recovered. The length frequency distribution of steelhead from Sawtooth and the East Fork is shown in Appendix F.

Sawtooth had a male:female ratio of 71% males and 29% females. The East Fork's male:female ratio was 55% male and 45% female.

Using Kent Ball's (Department Anadromous Researcher) lengths for one and two-ocean fish, steelhead returns by year class and sex are shown in Appendix R.

From the 56 Sawtooth CWT-fish recovered, the information indicated nine of the fish were four year olds, 44 were three year olds, and three were of unknown origin. From the four marked fish recovered from the East Fork, two were four year olds, one was a three-year old, and one was of unknown origin. Released steelhead by adult year class and sex are shown in Appendix S.

Adult Treatments

The returning adults at Sawtooth Fish Hatchery and East Fork Satellite are not treated or injected with any type of drug or chemicals prior to spawning.

Prespawning Mortality

Sawtooth Fish Hatchery and the East Fork facility had no prespawning mortality.

Spawning Operations

Sawtooth Fish Hatchery spawned steelhead on ten different days from April 6 through May 10, 1995. Spawning took place at the East Fork on three different days from April 10 through April 17, 1995. At Sawtooth, fish were spawned one to one and then combined into groups of two. At the East Fork, two males were spawned with one female.

At Sawtooth, 433 fish were spawned, 143 were females. The East Fork facility spawned 31 fish, 14 were females. Using the Von Bayer egg-enumeration method, 630,300 green eggs were collected from Sawtooth fish (4,407 per female) and 53,370 green eggs were taken from East Fork fish (3,812 per female).

After fertilization, the eggs were rinsed of blood and sperm with well water. Then the eggs were water hardened in a minimum 100 ppm solution of Argentyne (10% iodine) solution for one hour before being put into heath trays for incubation. All eggs tested negative for virus, and as a result, none were culled.

Incubation

After hardening in an Argentyne solution, the green eggs were incubated at one females eggs per Heath tray. Water flows were set at five gpm per incubator stack.

An additional 3,457,350 green eggs were received from Pahsimeroi Hatchery and incubated at Sawtooth. These eggs were incubated at two females per Heath tray.

All incubated eggs were treated with a 1,667 ppm 15-minute formalin flow-through treatment five times per week for fungal and bacterial control. Sawtooth's eggs eyed up at a 82.2% rate, yielding 543,100 eyed eggs. East Fork's eggs eyed up at a 75.3% rate, yielding 40,170 eyed eggs. Pahsimeroi eggs incubated at Sawtooth eyed up at a 79.7% rate, resulting in 2,755,000 eyed eggs (Appendix D).

Well temperatures varied from 39°F at the beginning of incubation to 44°F when the last fry were shipped. Nine temperature units (TU's) per day were the average during the incubation period. Eye-up occurred at 360 TU's and the eggs were shocked at 380 TU's.

The eggs were shocked by putting them in a half-full three-gallon bucket of water, then pouring them into a quarter-full bucket of water from about three feet high. One day after shocking, the eggs were machine-picked, using a Jenn-Sorter model JH machine, which picks and enumerates eggs. One to two days after picking, the eyed eggs are handpicked before transfer to the rearing hatcheries. The eggs were loaded at 50,000 to 100,000 eggs per 48-quart cooler of well water. Then the cooler was strapped shut and shipped.

We shipped 543,100 Sawtooth stock eyed eggs to Hagerman National Hatchery. Magic Valley Hatchery received 40,170 East Fork B-run stock eyed eggs. The Pahsimeroi eggs were shipped as follows: 803,000 to Magic Valley Hatchery as eyed eggs, 343,000 to Hagerman National Hatchery as eyed eggs, 1,359,000 eyed eggs and 42,000 fry to Niagara Springs Hatchery, and 208,000 eyed eggs were shipped to the Shoshone-Bannock Tribes for their streamside incubator program.

Release Acclimation of BY 95

For the fifth year in a row, steelhead smolts were held and acclimated at Sawtooth Fish Hatchery before final release. A total of 710,179 smolts were hauled from Hagerman National Hatchery and held in thirteen separate raceways, starting March 26, 1996. They were held from 15 to 50 days. All of the fish were fed a maintenance diet of Rangen's Salmon Grower. The screens were removed on April 19, 1996 and 554,499 smolts were forced out of the tailrace. An additional 66,022 smolts acclimated at Sawtooth were hauled to Torrey's boatramp and released the same day.

Between April 10 and May 16, 1996, an acclimation/residualization study was conducted at Sawtooth Fish Hatchery. During that time, an additional 22,507 BY94 and 85,025 BY95 smolts were released, bringing the total smolt release for 1996 to 796,638.

Fish Marking

Fish marking was completed in the rearing hatcheries and is shown in Appendix E.

CONCLUSIONS/RECOMMENDATIONS

East Fork Trap

As stated in last year's brood year report, the East Fork's adult returns are insufficient to meet egg needs or escapement goals. With the involved agencies approvals, a lower weir and trap would boost our facility's adult numbers by capturing all the fish that drop out before reaching the trap. Another option would be not to clip the adipose fin off of East Fork stock fish. A ventral fin could be clipped off to identify these fish as East Fork stock. With the adipose fin attached, the East Fork stock would not be fished upon, giving us more brood stock potential. This would allow us to plant less Dworshak stock smolts, which are proven to be less successful than East Fork stock fish.

Sawtooth Fish Hatchery

If the returning number of adults show that acclimation is a viable program, then we should plan on implementing the program every spring. But if the numbers of adults show that there is no difference or less returning "acclimated" adults, then we need to stop the program. Acclimation requires the hatchery to draw large amounts of water from the river, which also draw in emerging endangered natural chinook fry.

APPENDIX

Appendix A. Smolt Releases and Adult Returns.

Sawtooth Fish Hatchery Smolt Releases and Adult Returns

Brood Year	Release Year	Number Released	Adult Returns 3-year	4-year	5-year	Total Return	%
1979	1981	None	-	-	-	**291**	-inc.
1980	1982	None	17	66	165	248	-inc.
1981	1983	185,375	49	1,182	796	2,027	1.08
1882	1984	230,550	292	922	875	2,086	.91
1983	1985	420,060	51	452	1,318	1,821	.91
1984	1986	347,484	17	86	190	293	.08
1985	1987	1,185, 061	80	286	164	530	.05
1986	87-88	1,705,500	412	1,212	297	1,921	.11
1987	88-89	2,092,000	112	201	63	376	.02
1988	89-90	1,895,600	68	496	480	1,044	.055
1989	90-91	652,000	45	78	27	150	.023
1990	91-92	1,273,400	29	63	6	98	.008
1991	92-93	774,583	6	15	28	49	.006
1992	93-94	213,830	16	101	(1997)	-	inc.
1993	94-95	330,057	27	(1997)	(1998)	-	inc.
1994	1996	25,006	(1997)	(1998)	(1999)	-	inc.

Appendix A. Smolt Releases and Adult Returns (Continued.)

East Fork Chinook Smolt Releases and Adult Returns

Brood Year	Release Year	Number Released	Adult Returns 3-year	4-year	5-year	Total Returns	%
1979	1981	-	-	-	69	69	inc.
1980	1982	-	-	26	59	85	inc.
1981	1983	-	-	193	102	317	inc.
1882	1984	-	-	87	181	268	inc.
1983	1985	-	22	90	519	631	inc.
1984	1986	108,700	1	23	51	75	.06
1985	1987	195,100	6	55	27	88	.045
1986	1988	249,200	22	106	32	160	.064
1987	1989	305,300	12	23	23	58	.019
1988	1990	514,600	7	27	65	99	.019
1989	1991	98,300	15	18	13	46	.046
1990	1992	79,300	6	2	0	8	.010
1991	1993	35,172	0	0	0	0	.000
1992	1994	12,236	0	7	(1997)	-	inc.
1993	1995	48,845	3	(1997)	(1998)	-	inc.
1994	1996	-	(1997)	(1998)	(1999)	-	inc.

[a] Age classes based upon the following lengths: 3 yr. old: $\leq$ 64 cm, 4 yr. old: 64 to 82 cm 5 yr. old: >82 cm, returns include an unknown number of natural fish.

Appendix B. Sawtooth Fish Hatchery Water Quality Analysis of the Salmon River.

Nutrients (mg/L)	**1993**	**1985**
T. Ammonia as N	0.043	
	0.045	
T. NO2 + NO3 as N	0.073	0.088
T. Kjeldahl Nitrogen as N	<.05	0.26
T. Phosphorus as P	<.05	0.02
Ortho Phosphate as P	0.019	<.003
Minerals (mg/L)		
Sp. Conductance (umhos/cm)	157	135
Hardness as CaCO3	68	62
T. Alkalinity as CaCO3	74	63
Bicarbonate Alk. as CaCO3	74	63
Calcium	24	20.8
Magnesium	1.9	1.8
Sodium	7.0	3.8
Potassium	0.7	<1
Fluoride	0.85	0.58
Sulphate as SO4	5	<6
Total Metals (ug/L)		
Arsenic, Total	<10	<10
Boron, Total	<80	1
Cadmium, Total	<1	<1
Chromium, +6	<10	<50
Chromium, Total	<10	<50
Copper, Total	<10	<10
Iron, Total	20	120
Lead, Total	<5	<50
Manganese, Total	<10	10
Mercury, Total	<.5	<.5
Nickel, Total	<10	<50
Silver, Total	<1	<1
Zinc, Total	<2	<1
Miscellaneous		
Turbidity (NTU)	<1	1.8
pH (SU)	8.0	8.1
Total Cyanide (mg/L)	<.005	<.005
Total Residue	-	97

Appendix C. Sawtooth Fish Hatchery Results of Disease Sampling

BY94 Juvenile Chinook

Case #	Stock	Date	Data
94-631	Saw	11/30/94	Viro 0/10, FA 0/10, BACTE 0/8
94-632	Saw	11/30/94	Viro 0/11, FA 4/11, (4 TNTC 1 high)
95-332	Saw	07/13/95	ELISA 1/12, 5 fish pools, WHD 0/20, Viro 0/60
95-345	Saw	07/29/95	Phoma spp.
95-404	Saw	09/03/95	ELISA 0/35, WHD 0/35, Viro 0/35, FA 0/35
95-405	Saw	09/03/95	Viro 0/2, WHD 0/2, BACTE NSG
95-479	Saw	10/08/95	FAT 0/4, BACTE NSG
96-029	Saw	01/25/96	FAT 0/1, WHD 0/1, Histo no spores seen
96-030	Saw	01/01/96	FAT 0/1, WHD 0/1
96-031	Saw	01/01/96	FAT 0/1, WHD 0/1
96-086	Saw	03/18/96	FAT 0/20, ELISA 3/4, 5 fish pools, low OD #'s (0.106, 0.117, 0.115), WI-ID 0/20, Viro 0/20

Return Year 1994 Chinook Broodstock

Case #	Stock	Date	Data
94-378	Saw	08/08/94	ELISA 1/1 low, Viro 0/1
94-406	Saw	08/18/94	Research: open case
94-408	Saw	08/22/94	Viro 0/1
94-439	Saw	08/26/94	Viro 0/1
94-441	Saw	08/29/94	Viro 0/1
94-473	Saw	09/10/94	Viro 0/1
94-496A	Saw	09/20/94	ELISA 7/10 low, WHD 0/13, CSH 1/3, 3 fish pools
94-524	Saw	08/15/94	ELISA 1/1 low
94-598B	Saw	09/29/94	2/12 Diplostomum (light)

Return Year 1995 Steelhead Broodstock

Case #	Stock	Date	Data
95-163	EF	04/10/95	ELISA 2/5 low, Viro 0/4, WHD 0/5
95-164	Saw	04/06/95	ELISA 7/9 low, Viro 0/9, WHD 0/9
95-176	EF	04/13/95	ELISA 1\2 low, Viro 0/2, WHD 0/2
95-177	Saw	04/13/95	ELISA 8/10 low, Viro 0/10, WHD 112 5 fish pools
95-180	Saw	04/17/95	ELISA 8/10 7 low, I mod., Viro 0/24, WHD 1\2 5 fish pools
95-190	EF	04/17/95	Viro 0/8, ELISA 8/11 low
95-201	Saw	04/20/95	ELISA 8/10 4 low, 4 mod, WHD 112 5 fish pools
95-202	EF	04/17/95	WHD 0/11
95-208	Saw	04/27/95	Viro 0/23, ELISA 4/5 low, WHD 0/5
95-233	Saw	05/01/95	Viro 0/15
95-264	Saw	05/10/95	Viro 0/5

Appendix D. Survival Table for Chinook (BY94) and Steelhead (BY95) from Green Eggs to Released Smolts, at Sawtooth and East Fork Sites.

Chinook

Green Egg Number	Eyed Egg Number	Percent Survival	Released Smolts	Percent Survival From Green
Sawtooth Fish Hatchery				
29,933	26,232	87.6	25,006	83

Steelhead

Green Egg Number	Eyed Egg Number	Percent Survival	Released Smolts	Percent Survival From Green
Sawtooth Fish Hatchery				
630,300	543,100	86.2	530,385	84
East Fork Fish				
53,370	40,170	75.3	62,920**	118**

* All steelhead raised at other hatcheries.
**Number reflects count from Magic Valley Fish Hatchery estimate.

Appendix E. Summary of Smolt Releases and Marks.

Steelhead Sawtooth Stock

Mark Type	CWT Code	#PIT	# Fish Released	Release Date	Purpose
AD	None	1,401	85,025	05/16/96	Acclimation study
AD	None	400	22,507	05/16/96	BY94 2Yr rearing study
AD	10-45-26				
	10-45-27		66,022	04/19/96	Torrey's Hole, Suppl.
	10-45-28	300			
AD	None		424,029	04/19/96	Acclimated SFH weir Release, Production
AD	10-45-23				
	10-45-24		66,572	04/19/96	Acclimation SFH weir
	10-45-25	300			Production
AD	10-45-32				
	10-45-33		63,898	04/19/96	Acclimation SFH weir
	10-45-34	300			Production
AD	10-45-29				
	10-45-30		68,585	04/15/97	Direct release
	10-45-31	300			Production

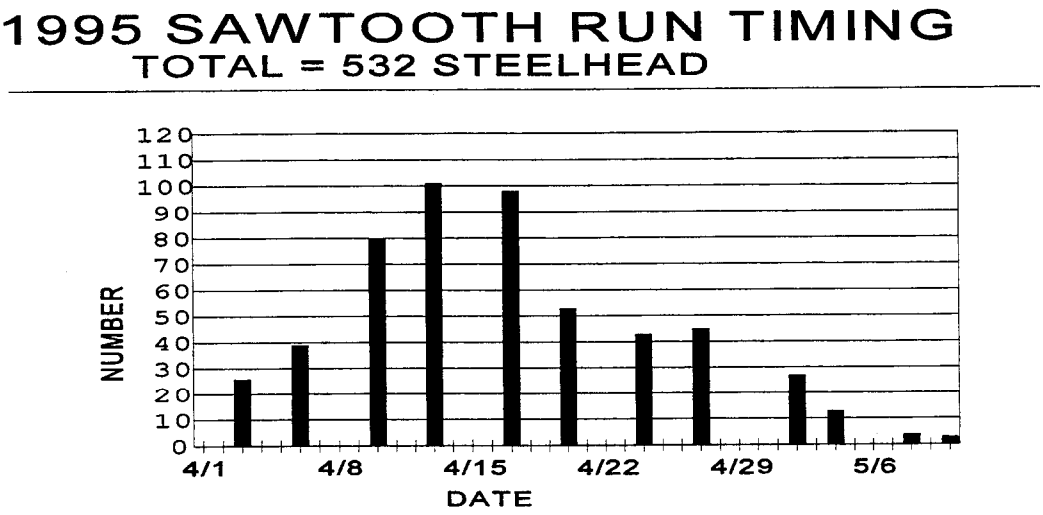
Steelhead East Fork Stock BY95

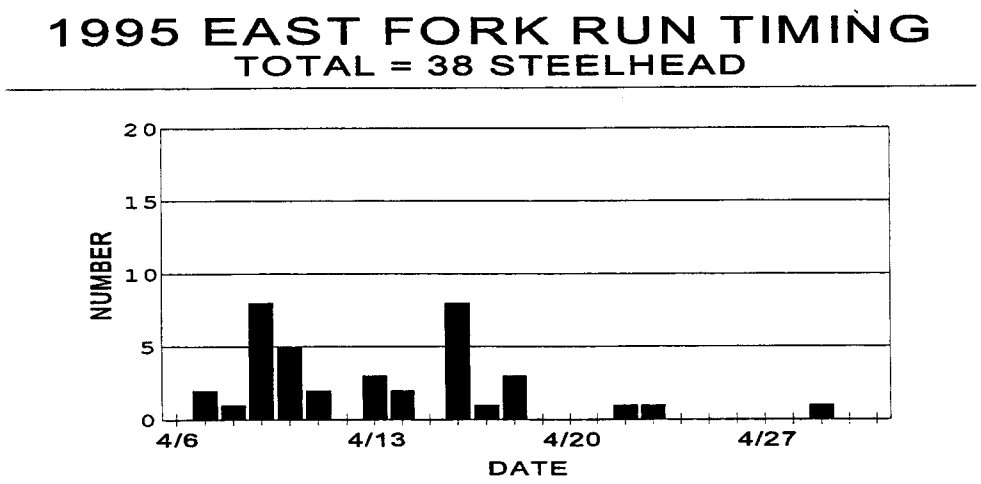
Mark Type	CWT Code	#PIT	# Fish Released	Release Date	Purpose
AD,LV	10-46-13		10,806	04/24/96	Contribution
AD,LV	10-47-09		22,050	04/24/96	Contribution
AD	None		29,048	04/24/96	Contribution

Chinook Sawtooth BY94

Mark Type	CWT Code	#PIT	# Fish Released	Release Date	Purpose
AD	None	1,260	25,006	03/26/96	Supplementation

Appendix F. Adult Steelhead Run Timing, Sawtooth and East Fork Sites, Return Year 1995.





Appendix G. Adult Sawtooth Spring Chinook Length Frequency Distribution, 1994.

Length(cm)	Fish Trapped	Males	Females
49	1	1	0
50	0	0	0
51	0	0	0
52	2	2	0
53	0	0	0
54	0	0	0
55	0	0	0
56	0	0	0
57	2	2	0
58	0	0	0
59	0	0	0
60	0	0	0
61	0	0	0
62	0	0	0
63	0	0	0
64	1	1	0
65	1	1	0
66	0	0	0
67	1	1	0
68	2	0	2
69	3	1	2
70	4	2	2
71	2	1	1
72	2	1	1
73	6	3	3
74	8	5	3
75	9	8	1
76	6	1	5
77	7	5	2
78	6	4	2
79	1	1	0
80	2	2	0
81	1	0	1
82	2	0	2
83	1	1	0
84	3	2	1
85	1	0	1
86	0	0	0
87	1	0	1
88	3	1	2
89	1	1	0
90	3	1	2
91	3	1	2
92	3	2	1
93	1	0	1
94	1	1	0
95	1	1	0
96	2	1	1
97	2	1	1
98	1	1	0
99	0	0	0
100	0	0	0
Totals	96	56	40

Appendix H. Adult East Fork Chinook Length Frequency Distribution 1994.

Length(cm)	Fish Trapped	Males	Females
74	1	1	0
75	0	0	0
76	0	0	0
77	1	1	0
78	0	0	0
79	0	0	0
80	0	0	0
81	0	0	0
82	0	0	0
83	0	0	0
84	0	0	0
85	0	0	0
86	0	0	0
87	0	0	0
88	2	2	0
89	0	0	0
90	1	1	0
91	0	0	0
92	1	0	1
93	1	0	1
94	2	0	2
95	2	2	0
96	0	0	0
97	2	2	0
98	0	0	0
99	0	0	0
100	0	0	0
117	1	1	0
125	1	1	0
Totals	15	11	4

Appendix I. Fork Lengths (cm) of Released Adult Steelhead, Sawtooth and East Fork Sites, 1995.

Sawtooth (26)

17 Males	9 Females
60	52
74	54
55	56
66	59
58	61
60	62
51	62
52	71 (natural)
62	71 (natural)
72	
64	
66	
58	
61	
59 (natural)	
78 (natural)	

East Fork (6)

4 Males	2 Females
75	65 (natural)
78	66 (natural)
79	
87	

Appendix J. Spawning Matrix for Adult Spring Chinook at Sawtooth Fish Hatchery. 1994.

Date Spawned	Female Length	Mark	Male 1 + 2 Length	Mark	Male 3 + 4 Length	Mark
08/08/94	70	Iv	70	Iv		
			92	Iv		
08/15/94	83	Iv	90	ad	89	-
			73	-	73	-
08/18/94	90	-	71	Iv	75	Iv
			80	Iv	75	ad
08/22/94	75	ad	78	Iv	76	ad
			94	Iv	80	Iv
08/26/94	71	Iv	94	Iv	53	ad
			76	ad	75	ad
08/29/94	76	-	89	-	70	-
			78	-	73	-
09/10/94	76	-	80	-	all other males previously used	
			78	-		

Appendix K. Adult Steelhead Length Frequency Distributions at Sawtooth And East Fork Traps. 1995.

Fork	Males		Females		Total
Length(cm)	Hatchery	Natural	Hatchery	Natural	Trapped
Sawtooth					
51	4				4
52	2		1		3
53	6				6
54	5		2		7
55	9		7		16
56	19		12		31
57	23		6		29
58	44		14		58
59	37		14	1	52
60	57		16		73
61	37		11		48
62	37		8	1	46
63	23		2		25
64	14		1		15
65	14		3		17
66	10		7		17
67	8		4		12
68	4		6		10
69	3		4		7
70	5		11		16
71	1	2	4		7
72	2		5		7
73	2		3		5
74	3		2		5
75	1		1		2
76			1		1
77	2		2		4
78	2				2
79	2		1		3
80			2		2
82			1		1
88	1				1
Totals	377	2	151	2	532
East Fork					
61	1				1
62	3				3
64	1				1
65	1			1	2
66	2			1	3
72			2		2
73	1		1		2
74	1		3		4
75	2				2
76			1		1
77			3		3
78	1		2		3
79	2				2
80	1		2		3
81	1		1		2
84	1				1
87	2				2
91	1				1
Totals	21	0	15	2	38

Appendix L. Age Class Totals from All Trapped Chinook. Return Year 1994.

Sawtooth	Length (Fk)	Year class	Number
Males -	≤ 64 cm	- 3 year old	6
	64-82 cm	- 4 year old -	36
	> 82 cm	- 5 year old -	14
Subtotal			56
Females	≤ 64 cm	- 3 year old-	0
	64-82 cm	- 4 year old -	27
	> 82 cm	- 5 year old -	13
Subtotal			40
Total			96

East Fork	Length (Fk)	Year class	Number
Males -	≤ 64 cm	- 3 year old -	0
	64-82 cm	- 4 year old -	2
	> 82 cm	- 5 year old -	9
Subtotal			11
Females	≤ 64 cm	- 3 year old -	0
	64-82 cm	- 4 year old -	0
	> 82 cm	- 5 year old -	4
Subtotal			4
Total			15

Appendix M. Age Class Breakdown by Released Chinook, Return Year 1994.

Sawtooth	Length (Fk)	Age Class	Number
Males -	≤ 64 cm	- 3 year old -	6
	64-82 cm	- 4 year old -	38
	> 82 cm	- 5 year old -	6
Total Males			50
Females -	≤ 82 cm	- 4 year old -	24
	> 82 cm	- 5 year old -	9
Total Females			33
Total released			83

East Fork	Length (Fk)	Age Class	Number
Males -	≤ 64 cm	- 3 year old -	0
	64-82 cm	- 4 year old -	2
	>82 cm	- 5 year old -	9
Total Males			11
Females -	>82 cm	- 5 year old -	4
Total Females			4
Total released			15

Appendix N. Feed Schedule for Sawtooth Spring Chinook, BY94.

Fpp	% BW Fed	Feed Size	Timing
su ----800	.035	#2/#3 str	12/94- 1/16/95
800---500	.033	#3 str	01/16- 02/28
500---400	.028	1.0 mm	03/01- 03/15
400---350	.025	1.0/1.3 mm	03/16- 04/01
350---300	.023	1.3 mm	04/02- 04/14
300---250	.022	1.3 mm	04/15- 06/01
250---150	.024	1.5 mm	06/02- 06/28
150---110	.024	1.5 mm	06/29- 07/04
110----90	.028	1.5 mm	07/05- 08/15
90------50	.030	2.5 mm	08/16- 09/25
50 -----25	.028	2.5 mm	09/26- 10/15
< ----25	Maintenance	3.0 mm	10/16- release

Appendix O. Summary of Marked Spring Chinook Released: Return Year 1994.

Mark	Number Released	Location
Adipose Clip	23,746	Blaine/Custer County Line Bridge
Ad-Clip/PIT	1,260	Blaine/Custer County Line Bridge
Total Release	25,006	

Appendix P. Summary of Spring Chinook Smolt Releases; Return Year 1994.

	Number	Fish per Pound	Pounds
Raceway 5	12,495	17	735
Raceway 6	12,511	24	521
Total	25,006	20	1,256

Appendix Q. Age Class for All Steelhead, *Return Year 1995.

Sawtooth	
One ocean males (<68 cm)	349
Two ocean males (>68 cm)	30
	379
One ocean females (<65 cm)	99
Two ocean females (>65 cm)	54
	153
East Fork	
One ocean males (≤73 cm)	9
Two ocean males (>73 cm)	12
	21
One ocean females (≤68 cm)	2
Two ocean females (> 68 cm)	15
	17

* These figures are based on Kent Ball's criteria for aging steelhead as described In Appendix R.

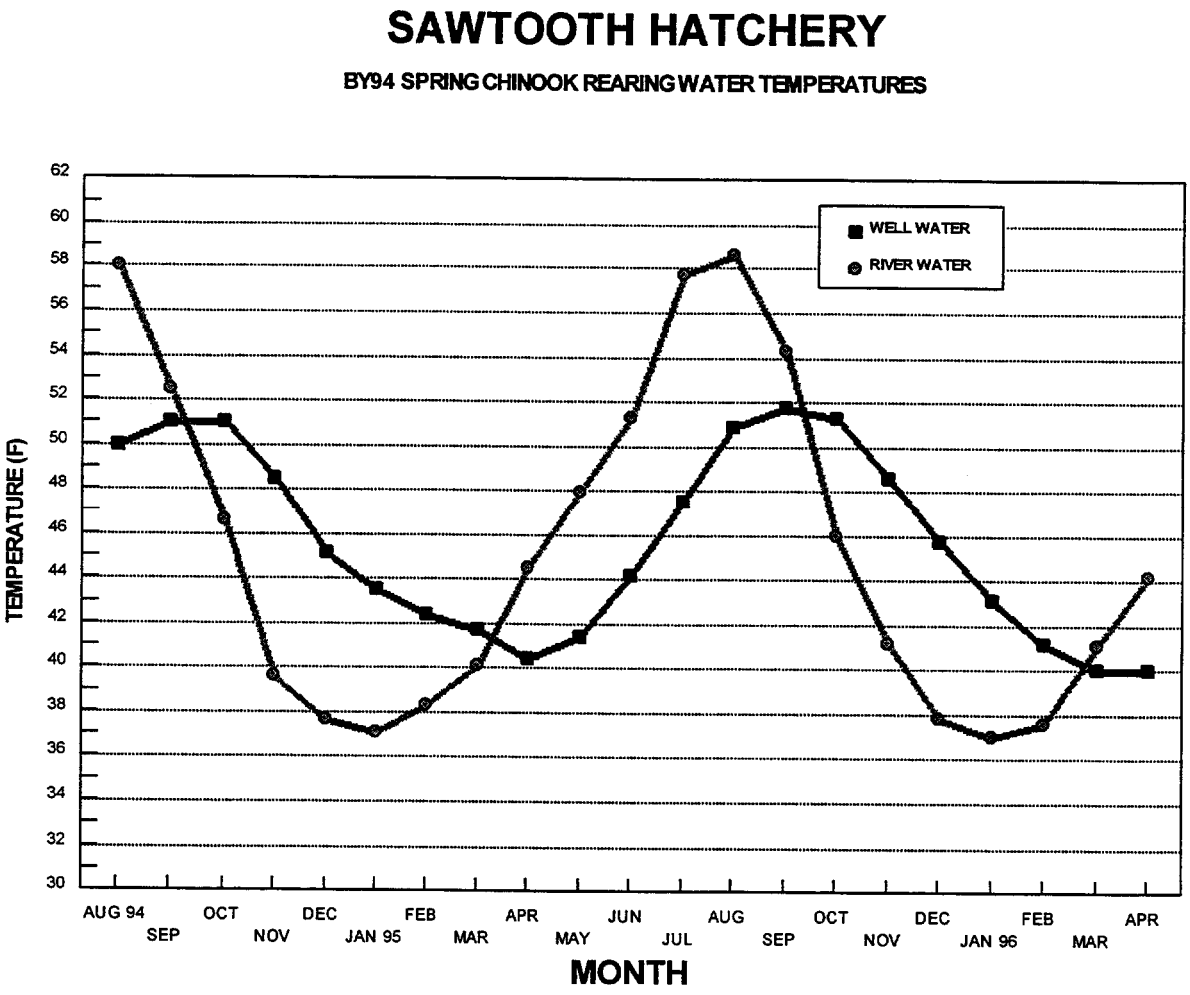
Appendix R. Criteria for Aging Steelhead, from Kent Ball, the Department.

"A" Male	≤ 68 cm - 2 year old (one ocean)
	> 68 cm - 3 or 4 year old (two or three oceans, respectively)
"A" Female	≤ 65 cm - 2 year old (one ocean)
	> 65 cm - 3 or 4 year old (two or three oceans, respectively)
"B" Male	≤ 73 cm - 2 year old (one ocean)
	> 73 cm - 3 or 4 year old (two or three oceans, respectively)
"B" Female	≤ 68 cm - 2 year old (one ocean)
	> 68 cm - 3 or 4 year old (two or three oceans, respectively)

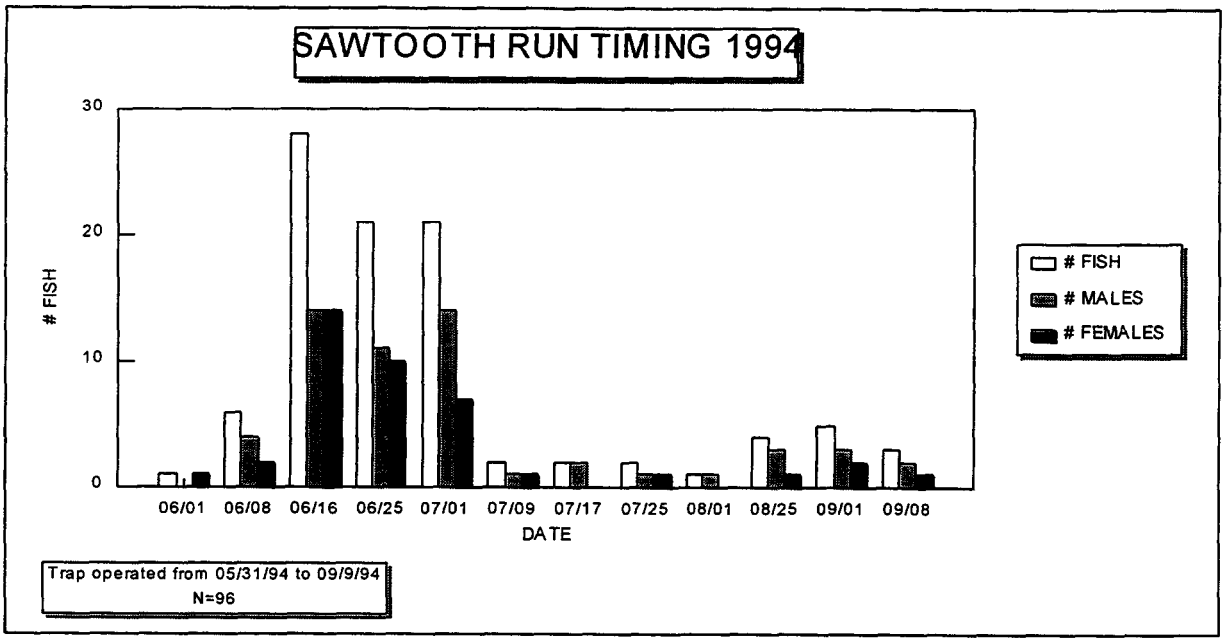
Appendix S. Released Steelhead by Year Class and Sex, Return Year 1995.

Sawtooth (26)					
Males -	2 year old	14	**Females -**	2 year old	7
	3 or 4 year old	03		3 or 4 year old	2
	Total	**17**		**Total**	**9**
East Fork (6)					
Males -	2 year old	0	**Females -**	2 year old	2
	3 or 4 year old	4		3 or 4 year old	0
	Total	**4**		**Total**	**2**

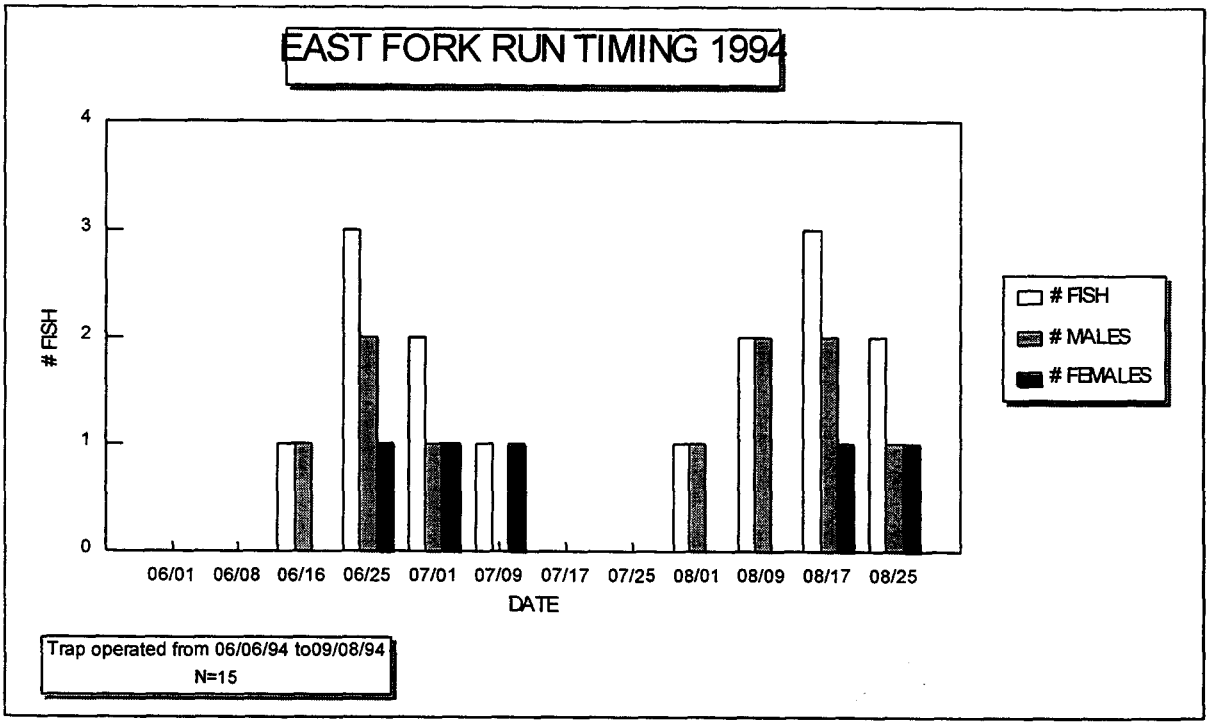
Appendix T. Rearing water Temperatures, 1994 at Sawtooth Fish Hatchery.



Appendix U. Sawtooth Spring Chinook Run Timing 1994.



Appendix V. East Fork Spring Chinook Run Timing 1994.



Appendix W. Sawtooth Spring Chinook Cwt Recoveries 1994.

SEX	LENGTH(cm)	CLIP
M	75	Ad
M	80	Lv
M	76	Ad
M	89	Lv
?	64	?
M	76	Lv
F	78	Ad
M	76	Ad
M	80	?
M	76	?
M	76	Lv
F	83	Lv
M	75	Lv

Appendix X. Production Cost Table (Includes Chinook BY94 and Steelhead BY95).

Chinook

Smolt Number	Lbs. Feed	Cost Feed	Lbs of Smolts	C	Total Cost	Cost Per 1,000	Cost Per Lb.
Sawtooth							
25,006	2,378	$670	1,250	2.0	$239,000	$9,560	$191.20
East Fork							
No BY94 East Fork spring chinook salmon reared.							

Steelhead

	Green Eggs	Eyed Eggs	Total Cost	Cost per 1,000 Eyed Eggs
Sawtooth	630,300	543,100		
East Fork	53,370	40,170		
Pahsimeroi	3,457,350	2,755,000		
Totals	6,073,581	5,421,647	$134,000	$24.71

Note: Total costs less capital outlay. Costs include operating East Fork fish trap and running wells for entire rearing period.

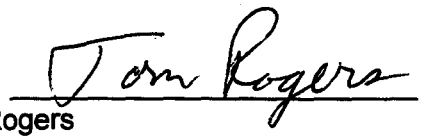
Submitted by:

Brent Snider Hatchery Manager II

Kurtis Schilling
Assistant Hatchery Manager

Approved by:

Virgil K. Moore, Chief
Bureau of Fisheries



Tom Rogers
Fish Hatchery Supervisor